

# Hybrid Beacon and Gps Based Women Safety Device for Alerting During Emergency

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## ABSTRACT

According to WHO surveys, 35 % of women worldwide face irregular health issues in public space like movie halls, malls, according to NCRB-social- government organization. This paper outlines an efficient woman's protection scheme. We are implementing a prototype system here that ensures woman's safety not only for areas having infrastructure but also for those that lack infrastructure. This helps to protect and alert the family members and police immediately. This work shows easy and compatible hybrid of both GPS(Global Positioning System) and Beacon technologies which will empower the citizens and serve as a multifunctional device and thus adds an extra layer of protection. Women are proposed to carry a wearable heartbeat sensor along with a Galvanic Skin Response sensor to detect the abnormal situations automatically. Once the abnormal situation is been detected analyzing the sensor values, our system checks the GSM(Global System for Mobile Communication) for the signal strength, if the signal is not present beacon-based signal transmission is been triggered. A switch has been incorporated with the planned system to prevent unnecessary stressful circumstances. The warning message will not be sent to the nearest police station or family if the females press the switch. The current position on the cloud server will also not be changed.

**Keywords:** GSM,GPS,Beacon technology,Heartbeat sensor,Galvanic Skin Response

## I. INTRODUCTION

Currently, women's safety is one of the major issues the present world is facing. Society these days has become a menace for women. Most women leave their homes for work at any time. Kidnapping, rapes, and sexual harassment have become part of our day to day lives. Crime against women has risen to a greater degree in the past few years. Many women are now scared and face insecurity regarding their safety. According to statistics, more than 80% of women are always distressed due to their safety when outside. Woman's protection has become an important topic around the world. Women are harassed not only in their place of work but also in their houses, public places such as movie halls, malls, public

transport etc. In India alone, the rate of crime against women in recent years has risen rapidly. According to the study released by NCRB (National Crime Records Bureau), there was a 55% crime rate reported against women. Women have historically been limited to the four walls of homes, and usually wouldn't step out of their house for work in the past decades, but now they have the capacity and resources to stand equally at the same level as men in all industries since globalization. Women are now stepping out of these confined boundaries and are able to show their capabilities and skills in all kinds of fields. It is a positive sign that society's patriarchal mindset has shifted to some level, but not to the level that it was intended to. Rapes and harassment are evil which have no limits. It exists in the part of today's world may it be developed cities or rural villages. A 2-year-old baby

and a 75-year-old woman are not distinguished. Rape and harassment cases have become part of our society, from parties to offices to our homes.

Different structures have been designed to provide women with protection. All the systems have their own kind of algorithms and technology to recognize a woman's unsafe circumstances. Many devices and applications are being built in this direction due to technological advancements. In particular, many innovative devices and apps have been developed and IoT has played an important role in safeguarding women. The Internet of Things (IoT) [2] defines the network of "things" physical objects that are integrated with sensors, apps, and other technology to communicate and share data over the Internet with other computers and systems. In order to optimize body parameters, various IoT devices use sensors that can directly send emergency messages to guardians, female helplines, or police stations. Wearable devices are known to be effective in that situation. Hardware gadgets that use GPS (Global Positioning System) to detect the location of the device have been designed. Such systems often use sensors to continuously track variables such as body temperature, heart rate, anxiety, and give parents the data to ensure that their daughters are well in the situation of need and panic. Many sensors are present these days that help to constantly check and maintain different variables. Few sensors are called panic sensors that help to detect the panic conditions of the women by her irregular heartbeat and temperature variations in a woman's body. Sound detectors are commonly used to distinguish changes in

the voice of females when they are in threat. For the monitoring of woman's dangerous conditions, most programs and mobile base applications use hand-held devices, such as phone mike to track women crying, camera to take photos and film videos.

## II. LITERATURE SURVEY

Where women have to trigger the GPS manually, this female safety application is creative[3]. If females do not trigger the GPS, the Global Positioning System with Global Mobile Communication System asserts warnings to the appropriate registered numbers. In order to change the location, the constraint in this method is that the network connexion must be consistent.

A new convincing security and warning system for women has been established[4]. In the areas of monitoring, recording, and self-defence, the sophisticated framework ensures protection for women. In order to contribute favorably, the smart women's security mechanism is integrated with the Internet of Things and open source technologies. The drawback of this system is that the victim has to manually speak to her family which might not be possible in times of panic.

When women are targeted by the assaulter concerning the movement of mistrust, a system is for such conditions is innovated [5]. The system collects the image of the abuser and transfers it to the appropriate cloud server. In this method, the limitation is that the network must be connected without any interruption.

Bhavale et al.[6] have suggested a wireless sensor kit based on Arduino that is versatile to assist the girl from being assaulted. The framework will collect the picture when the trigger is pulled, collect user information, and send an alert to listed mobile numbers with the URL of the picture taken.

A software application called "B'Safe & B'Secure" for woman's protection has been invented by Nadaf et al.[7]. If the victim is in trouble, with the assistance of the SOS technique, the data is forwarded to the already registered emergency contacts along with the location of the victim.

The GPS protection device for women is incorporated with a camera that immediately records the incident[8]. The program is extremely efficient and safe, with the female user provided with login credentials to change the details in the application. The female user's login details are also known by the close relatives so that the data can be viewed. The constraint of this framework is that it might not be possible for the female to log into the system in a vulnerable position.

Here the development of an application called WOS is described[9]. Related information is submitted by the WOS app user's close relatives. If the victim shakes the mobile phone vigorously in the event of a problematic

situation, then the WOS app notices the family members of the user with the information of the location. In this method, the limitation is that this creative programme only operates on smart phones.

An electronic device that uses multiple sensors and a micro-controller is implemented. A here crucial role is played by sensors such as sound sensors and flex sensors[10]. The voice of the women is analysed by the sound sensor and the action required will be enforced. The restriction in this framework is that close relatives of the women must also have the software provided on their respective cell phones.

A device with different functionality switches has been proposed [11]. With a precise feature, each switch is integrated. It is asserted that the buzzer should be on a red button. A blue switch is asserted to provide warnings to the close relatives. A green switch is believed to report the photos and videos of the abuser. In this method, the limitation is that the program's integration costs are too high.

## III. PROPOSED METHODOLOGY

India is a developing country and has the potential to be the world's most advanced and civilized country that needs the talents and capability of its women population too. Thus problems regarding the safety of women need to be voiced. Our methodology consists of sensors, GSM, GPS, and PIC microcontroller with sensors tool which keeps women health variables under check all the time. The GPS system monitors the position and transmits the alert messages via GSM to three mobile numbers with a location.

The block diagram of our proposed system is as shown in Figure 3.1:

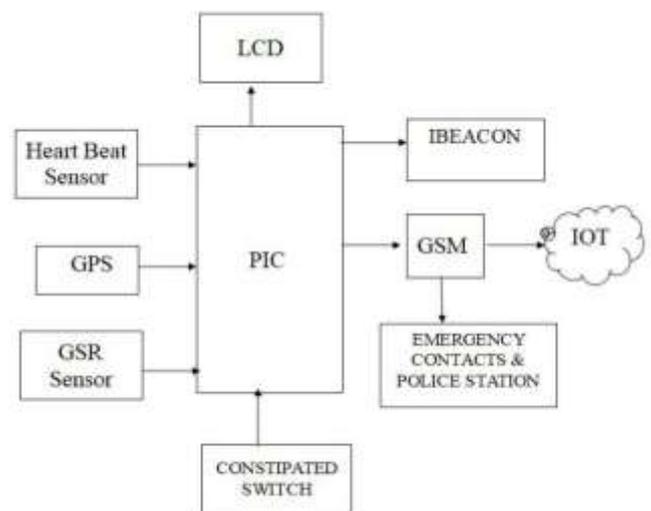


Figure 3.1: System Architecture

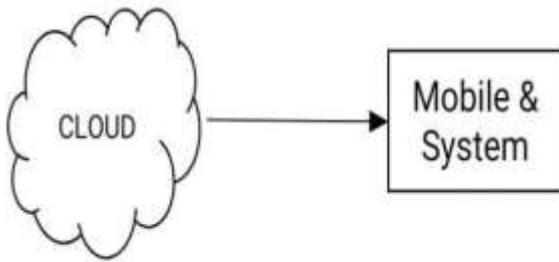


Figure 3.2: Transmission section and Monitoring section

### III.1. HARDWARE SPECIFICATION

The hardware components used in this project are:

#### 1) PIC Microcontroller

PIC(Programmable Interface Controllers) micro-controllers are widely used to perform variety of tasks and are very easy to program.They are relatively inexpensive. PIC16F877A has 40 pins and 256 Bytes EEPROM data memory. Several "low-level" assembly language, such as Assembly, C, and Basic, can be used to write a program for the microcontroller.



Figure 3.1.1: PIC16F877A Microcontroller

#### 2) GSR Sensor

The galvanic skin response (GSR) which comes under the electro dermal activity, or EDA refers to changes in the response of the sweat gland that represents the strength of our emotional state, generally referred to as emotional arousal. This sensor checks the emotional arousal via skin conductance. Thus if any abnormal value occurs due to distress or panic sensor sends a message to the controller. Input voltage and output voltage is of value 5V. Output is in the form of analog.

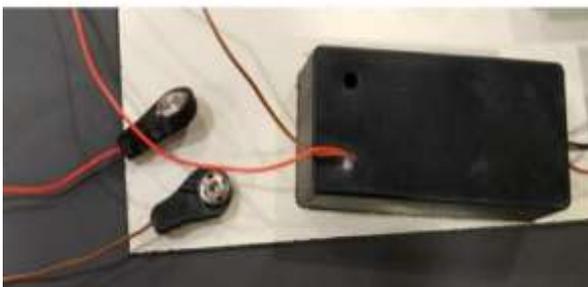


Figure 3.1.2: GSR Sensor

#### 3) Heartbeat Sensor

Heartbeat Sensor is an electronic device that is used to determine the pulse i.e. speed of the heartbeat; any nerves in the human body can be positioned with this sensor. The output is generally in an analogue fashion. It can then record the shift in the heartbeat.It has wide supply range of DC 3-4V.It has high sensitivity and is fully RoHS compliant.



Figure 3.1.3: Heartbeat Sensor

#### 4) GSM Modem

It is the most popular digital mobile telephone system and is also regarded as a second-generation technology. GSM is a global framework for mobile connectivity. Tele-services, bearer services, and auxiliary services are some of the GSM services. GSM offers separate services focused on voice and data transmission. GSM is mainly used for its teleservices for voice transmission and messaging services.This GSM Modem works as a SIM card for any GSM network and functions similarly to a cell phone that has its own distinct phone number. The RS232 port on this modem can be used to interface and build embedded software, which is an advantage of using it. The SIM900A is a dual-band GSM/GPRS solution packaged in an SMT module with an industry-standard interface.It has input voltage range of 4.5V-12V DC.GSM's most apparent benefit is its universal usage all over the world. GSM has a harmonized spectrum, according to Gsmworld.com, which ensures that even though various countries can function at varying frequencies, users can move and retain the same number effortlessly between networks.



Figure 3.1.4: GSM Modem

### 5) GPS Modem

A radio navigation system used to provide geolocation, GPS is a Global Position System; which is primarily used in armed forces, which application can be used to map a person's location and to determine an object's position. A message regarding the current location, time, coordinates (latitude and longitude) of the area where it is located will be transmitted via GPS. It creates a relation to the appropriate number of satellites, and at least four satellites should be used to determine the system's current position. It has supply voltage of 12V DC and uses UART RS232 as interface.

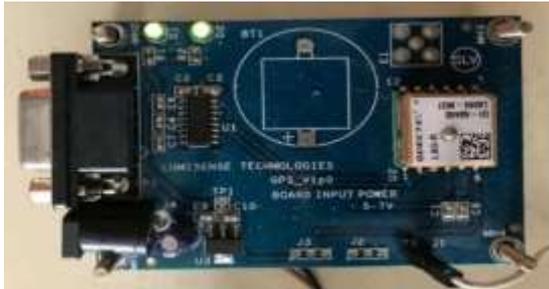


Figure 3.1.5: GPS Modem

### 6) Beacon Transmission

A beacon is a small hardware device in the scope of location-based services that allow data transfer to mobile devices within a defined range of the system. Receivers must have Bluetooth switched on for most applications, have the corresponding mobile app downloaded with location services available, and must have opted in to receive the notifications from the sender. The beacon system is extremely simple. A CPU, radio, and batteries are included in each unit, and it works by transmitting a tag continuously. It has an operating Voltage of 3.3V DC.

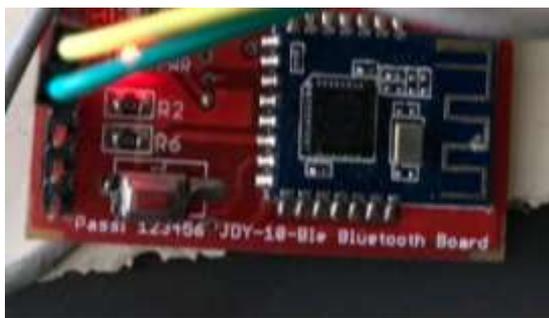


Figure 3.1.6: Beacon Modem

## III.2. SOFTWARE REQUIREMENTS

- Embedded C
- MP Lab
- Android Studio
- HTML, CSS

## IV. IMPLEMENTATION

In this proposed system, we propose a wearable Heartbeat sensor along with a Galvanic Skin Response sensor to detect the abnormal situations for the women

automatically. When the system identifies abnormal values are triggered, tracks the place of the women and sends an emergency alert in the webpage with location and distance between women and missed a place.

This work gives a easy and interoperable hybrid of both GPS and beacon technologies will empower the citizens and serve as a multifunctional device.

Once the abnormal situation is been detected analyzing the sensor values, our system checks the GSM for the signal strength, if the signal is not present beacon-based signal transmission is been triggered. We use a hybrid architecture combining both GSM and beacon-based data transmission. On abnormal situations, through GSM the family members, police are alerted with the exact allocation details (latitude, longitude) which are obtained from the GPS. Unfortunately if the GSM doesn't have the signal during that abnormal situation, beacon based data transmission is invoked.

The transmitter is kept with the women which would send the signal to all smartphone users who cross those streets, area. All citizens are asked to install ibeacon mobile app. Automatically once the mobile app pairs the transmitted signal, using the mobile internet the current location along with the beacon ID is been updated in the IoT page. A switch has been incorporated with the planned system to prevent unnecessary stressful circumstances. The warning message will not be sent to the nearest police station or family if the female press the switch. The current position on the cloud server will also not be changed.

## MODULES

- Interfacing sensors
- Programming Micro-controller
- Alert Message using GSM
- Internet of Things (IoT)

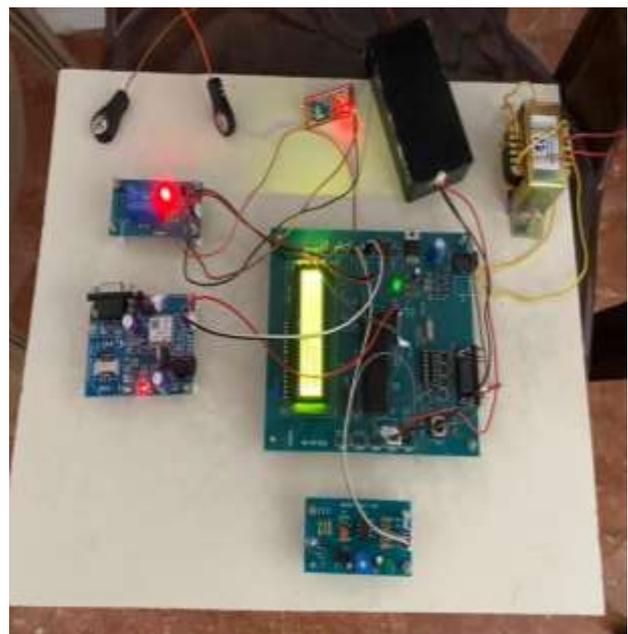


Figure 4.1: Hardware setup

As shown in the figure 4.1 the GSM modem is directly connected to PIC with an input of 5V. Both the sensors are also directly connected to the microcontroller. A relay is used to which the beacon modem is connected which in turn is connected to PIC. The microcontroller is programmed using MPLab software. GPS initiates a procedure that resolves a series of equations to locate the exact current location, which may take place within minutes or seconds, depending on the receiver's power. The GPS does not enable the user to send the data; it works separately to increase GPS positioning status via internet reception. Like a module that can be installed in any mobility unit, this GPS system is available, so this system can be useful for women to control positioning details when they feel vulnerable or in conditions of risk.

### V. RESULTS AND DISCUSSION

The main aim of the framework is to provide women in unsafe circumstances with protection and security. The sensors used ie heartbeat sensor and the galvanic skin response sensor will continuously monitor the parameters as shown in figure 4.



Figure 5.1: LCD screen display

When an abnormal reading is incurred the microcontroller receives the commands and the GPS measures the women's current latitude and longitude values. The GSM module will send SMS to the already registered emergency numbers stored in the microcontroller as shown in figure 5 and also alert message will be sent to the nearby police station that contains the current location of the victim.

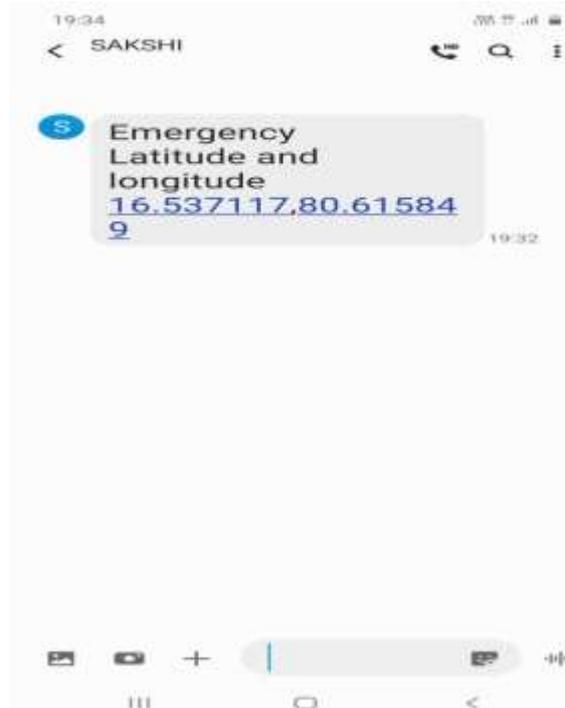


Figure 5.2: Emergency SMS

But if the GSM module doesn't have a signal then beacon based transmission will be enabled. All the nearby citizens with ibeacon app as shown in figure 5.3 will be sent a message along with beacon id of the victim. Automatically once the mobile app pairs the transmitted signal, using the mobile internet the current location along with the beacon ID is been updated on the IoT page as shown in the figure 5.4. Once the IoT page is updated police can reach easily to that particular location. Thus within 10 minutes the women's location during rape, kidnap situations can be identified by the police by logging onto the IoT page despite jammer, no signal zones.



Figure 5.3: IBeacon app



Figure 5.4: IoT page

## VI. CONCLUSION

The developed framework for the protection of women guarantees women the opportunity of achieving protection safety and reliability. Work unaccompanied with the introduction of this established method guarantees security that will enable women to work and lead their life without any fear about their safety. This project concentrates on a safety infrastructure built specifically to serve the purpose of providing women with safety and security so that they never feel powerless when facing certain safety challenges. The proposed model consists of GSM, GPS, PIC Micro-controller, Beacon technology, and IoT which are very reliable and well-integrated. The proposed approach includes multiple sensors that continuously monitor different variables. IoT (Internet of Things) is a fairly new concept that is rapidly evolving. By using IOT-based technology, a woman's device location can be controlled and tracked by family relatives and police. In a problem scenario, the reported contacts will receive SMS. The location of the person can be organized through latitude and longitude positions, so appropriate steps can be taken. The proposed project shows a easy and compatible hybrid of both GPS and Beacon technologies The scheme is cost-effective and not only aimed for project setup but can also comply with real-time scenarios.

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